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UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Summary Review of Monthly Reports*
for
SOIL CONSERVATION SERVICE RESEARCH**
APRIL 1950

EROSION CONTROL PRACTICES DIVISION

A Good Tillage Equipment Field Day - Hugh C. McKay, St. Anthony, Idaho.-"A tillage equipment field day was held in the Power County Soil Conservation District on April 19. It was a cooperative demonstration put on by the Power County Soil Conservation District Supervisors, the County Extension Agent, local Equipment dealers, and the Operations and Research Divisions of the Soil Conservation Service. The purpose of the field day was to demonstrate the various tillage implements used in a stubble mulch program. It was a very successful day with some 250 farmers attending the demonstration. It started at 11 o'clock in the morning and was completed at 3:30 p.m. The equipment dealers furnished lunch for the attending farmers.

"We were only interested in demonstrating types of equipment for all of the work except the sweep plows. There was no use in demonstrating each piece of equipment that each dealer had, so the dealers divided up the equipment among themselves so that we would not have over one or two rotary subsoilers, disks, rod weeder and drills, but they were all free to demonstrate their particular make of sweep plow. We had some ten different sweep plows represented. In this manner, we were able to cut down on the time needed.

"We tried to follow through the complete stubble mulch program from preparatory tillage to seeding. Many of the farmers expressed surprise that the rod weeders worked as well as they did under the conditions present.

"The spot picked for the demonstration had fairly heavy straw and a heavy sod growth of cheat grass. This spot was picked because it was felt it would bring out the good and bad points of all the sweep plows which it did very well.

"There were a few things we thought could still be done to increase the value of the demonstration. We would still like to cut down on the number of implements so that the time would be shortened. The spot for the demonstration should be picked in the fall before, and all preparatory tillage done that fall so the field would be under more normal working conditions. Also, we would like to eliminate any salesmanship on the part of the equipment dealers for that day. We only had one dealer that gave any trouble, but he was persistent. I felt it was a very successful day and it contributed much to the conservation work in that District."

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** All research work of the Soil Conservation Service is in cooperation with the various State Experiment Stations.

Relationships Between Soil Nitrate Content and Tobacco Yields -

Roy C. Dawson, College Park, Md.-"Some interesting relationships were found between the nitrate content of soil samples taken at different dates during the growing season and tobacco yields as reported by Mr. Britt in the monthly summaries for February. The samples were taken from ridge rows growing tobacco after early and late turning of various winter cover crops. Correlation coefficients for the two variables (soil nitrate content vs. tobacco yield) are shown in the following table.

Correlation between soil nitrate content at different dates during the growing season and tobacco yields at harvest time.

June 8		June 23		July 7		July 28		All Dates	
0-1'	0-3'	0-1'	0-3'	0-1'	0-3'	0-1'	0-3'	0-1'	0-3'
.462	.493	.572	.462	.805**	.776**	.711**	.455	.770**	.697*

* and ** indicate significance at the 5% and 1% levels, respectively.

"Highly significant correlation coefficients were obtained on July 7 for the surface foot of soil and for the 0-3 foot profile. The soil nitrate content was higher at this time than on any of the other dates of sampling. Although the overall soil nitrate content had decreased greatly by July 28, there was still a highly significant relationship between the nitrate content of the top foot of soil and crop yields. When mean nitrate contents for the four dates were averaged and compared with crop yields, significant correlations were obtained, the degree of significance being greater for the top foot than for the 0-3 foot depth. No significant relationships were found between soil nitrate content during the earlier dates of sampling and tobacco yields.

Since there was a great demand by the crop for nitrates between July 7 and July 28, correlation coefficients were calculated for differences in nitrate levels on the two dates as compared to tobacco yields. The relationship was not significant for the top foot of soil, but was significant for the 0-3 foot depth."

Drouth, Wind Erosion and Some Promising Control Practices - H. G. Porterfield, Brownfield, Texas.-"What is that peculiar smell? It's dust. This smell is caused by dust coming from cultivated land that has had only .63 inches of moisture in 6-1/2 months. This dust is finer and penetrates in houses worse than typical South Plains sand storms which have occurred since cultivation began. Perhaps this is the all time record of drouth for an Experiment Station in the United States and especially in a farming area.

"When this .63 inch of moisture for the 6-1/2 months period is compared to the 39 year average at Lubbock, Texas, a distance of 46 miles, some rather startling information is revealed. This amounts to 1/10 of normal precipitation for the period. The normal is 6.29 inches. In comparing this with previous drouths it is found that in 1916 and 17 precipitation for this 6 months period was 1.85 which was the lowest recorded until this year. The 1949-50 drouth period had approximately 1/3 the moisture received during the 1916-17 drouth. The greatest amount received in any 24 hour period during the 6-1/2 months was .17 on December 30. During one 103 day period .12 inch of moisture was received and all of this was in one 24 hour period. The highest amount of moisture received during this 6-1/2 month period was in 1914-15 when precipitation measured approximately 14 inches.

"The people of the Plains expect some drouth and sand storms with moisture being 1/2 to 1/3 normal, and usually have a joking, healthy, outlook on the weather. However, in this case with moisture 1/10 normal for 6-1/2 months, joking has about ceased.

"Dust storm conditions have been severe. A total of 14 separate storms occurred during April. These were divided into 5 severe storms with a total of 49 hours, 3 moderate which accounted for 13-1/2 hours and six light of 41-1/2 hours with a total duration of 104 hours. This seemed like plenty of dust storms but in a conversation with a real old timer who was here when the land was in range, we were told about a storm which ranged from light to severe for nine continuous days.

"Humidity has been extremely low which has made soil movement possible without high wind velocities. One neighboring farm has caused considerable damage blowing onto the station. This was taken into account when the plots were laid out, but for these conditions our borders were too narrow. The station has caused no damage to adjoining farms, however some damage has occurred between plots. The arrangement of plots on sandy land soil has been a continuous problem to eliminate border hazards and hummocks. Larger plots would largely solve the problem but land isn't available. The surprising thing is that some plots on both Class III and IV land are free of wind erosion.

"The 1948 and 49 deep broke plots which were chiseled in 1950 are free from erosion and early listed plots on deep broke land have held almost 100%. Vetch, Austrian Winter Peas, Rye and Winter Wheat while severely damaged from drouth, have held the soil from 95 to 100%. Close drilled 20 inch sorghum covers have been effective. Forty inch row spaced grain sorghums on land that has never been deep broke has allowed the most erosion. In some cases hummocks to a foot high have formed with corresponding removals. Up until 2 years ago this was considered the most effective control method. Twenty inch deep broke Class IV land is holding considerably better than 12 inch deep broke."

Nitrate Nitrogen Accumulation in Relation to Tillage Practices in Stubble Mulch Studies - Charles J. Whitfield, Amarillo, Texas.-"Very little live wheat remains on the stubble mulch plots after the severe damage from drought and greenbugs of the past two months. With plant growth at a standstill, rapid accumulation of nitrates has taken place on most of the plots, and concentration of up to 70 ppm. of $\text{NO}_3\text{-N}$ was found in the surface soil of some of the fallow plots on March 29.

Table 1.--Pounds per acre of nitrate-nitrogen in top 4 feet of soil of stubble mulch plots, Amarillo Experiment Station.

Tillage Method	Pounds per acre Nitrate - Nitrogen	
	February 7	March 29
	<u>Continuous wheat</u>	
Subtilled	36	82
Oneway	76	167
Hoeme	49	137
	<u>Fallow</u>	
Subtilled	69	84
Oneway	114	163
Hoeme	99	107
	<u>Wheat-on-fallow</u>	
Subtilled	148	146
Oneway	211	252
Hoeme	111	164

Rye Winter Cover Effective in Drying Out Claypan Soil for Spring Plowing - D. D. Smith, Columbia, Missouri.-"Observations have indicated that a superior seedbed could be prepared for soybeans following a winter cover of rye than with other covers. This has been attributed to the dehydrating effects of the early growing rye in drying the claypan soil, normally wet and slow to warm in the spring. Soil temperatures and moisture samples were secured for a period of about two weeks prior to plowing of the plots. About 1/2 inch of rain occurred April 9 and 10. Soil moisture samples secured April 13 and 17 indicated a greater loss of moisture from the surface soil under rye than under either meadow or sweet clover. There was little difference in average temperatures. Losses of moisture per 24-hour period from under the different covers were as follows:

Rye	.0139 In.
5th year meadow	.0089
3rd year meadow*	.0044
2nd year meadow	.0087
2nd year sweet clover	.0031
Oat stubble	.0029

* Grass inferior to that of other meadow plots.

Vetch Yield in Relation to Land Classes and Rotations - B. H. Hendrickson, Watkinsville, Ga.,-

Average of all rotations with vetch (green manure) yields in
tons per acre green weight tops

	Land Classes		
	II	III	IV
1950	3.55	3.40	4.22
4-yr. Avg. (1943-46)	5.39	4.27	3.70
4-yr. Avg. (1947-50)	7.36	6.94	5.68

"All 1950 vetch green manure yields were reduced by the dry winter. Yields on Land Classes II and III (Cecil sandy loam and sandy clay loam topsoil) were generally lower than on Class IV which is clay. On average land, vetch green manure yields were better by 2 tons per acre in 4-year Rotation No. 20 (Oats-lespedeza, vol. lespedeza, cotton-vetch, corn) as compared with Rotation No. 3 (a 1-year succession cotton-vetch). The best vetch yield, 5.34 T/ac., was in a 3-year lespedeza-based rotation on Class IV thin clay land.

"Volunteer Caley peas produced the highest yield of any green manure crop in 1950, namely 5.68 T/ac. on Class III land."

Earthworms on Long Island Experimental Plots - John Lamb, Jr., Ithaca, New York.- "Regardless of which comes first - the earthworm or the soil condition - there can probably be general agreement that earthworms are desirable except perhaps on golf greens. The plots of our cooperative experiment at the Long Island Vegetable Research Farm at Riverhead were checked during the last week in March for the presence of earthworms. None were found even though the treatments in 1949 included seeded grain and also duck manure, wood chips, and straw plowed under in the spring and applied as a mulch on rye following potatoes in late fall. A few plots of other older experiments on the farm were then checked with more success. Three worms per square foot to plow depth were found on plots which had received horse manure at the rate of 40 tons per acre annually for the 25 years preceding 1948. None were found on check plots which had received no manure and no fertilizer. These plots were in potatoes in 1947, 1948, and 1949 with rye winter cover. There were 7 worms per square foot under ladino clover seeded in 1947 at another location on the farm. The soil on the manure plots, however, showed much more signs of being worked over by the worms than the soil under the clover.

"A worm count was made a few days later on plots of the manure experiment at Marcellus. The cover was corn stubble with no winter cover crop. The count was 37 worms per square foot. This is not greatly different than the count of 31 per square foot obtained by Mr. Hopp in July 1946 on these same plots when corn was growing.

"Apparently there is much more involved in the problem of securing and maintaining an earthworm population than late fall protection. We plan to continue checking the Long Island plots."

Cover Crop Effects on Tobacco Land - T. L. Copley, Raleigh, N. C.-

"The 1949 data for our revised Tobacco Cover Crop Experiment shown in the table below reveal some very interesting results.

1949 Soil Loss

Treatment	Jan. 1 to Aug. 31		Sept. 1 - Dec. 21		Annual Total	
	Tons per acre	Percent of check	Tons per acre	Percent of check	Tons per acre	Percent of check
Check - no cover	5.91	--	.25	-	6.16	-
Nit. Rye grass, turned early	5.14	87	1.14	456	6.28	102
Nit. rye, turned early	5.37	91	1.10	440	6.47	105
Nit. rye, turned late	4.41	75	1.02	408	5.43	88
Rye-vetch, turned late	4.71	80	1.01	404	5.72	93
Nit. rye - mulch balk	1.67	28	.67	268	2.34	38
L. S. D.	.50	8			.50	8

"At September 1, all winter covers had caused some reduction in soil loss; though, while some differences were small, all were significant. During the fall period of land preparation and seeding of the new cover crops the picture changed however, and most seeded plots lost more than four times as much as the undisturbed check. Losses during this period offset the gains previously made by some of the treatments. The method of land preparation used resulted in a clean seed bed with no residue left on the surface, such as many farmers would term excellent preparation. It is apparent, however, that these September losses could have been avoided had some of the residue been left on the surface when the cover crops were seeded. This has been done before with good results.

"Notice that turning the cover crops late each year after the rye had headed out resulted in less soil loss than when turned early. Notice also that the mulch balk method was outstanding in its effect on soil loss. In fact, this was the only treatment considered effective. Beneficial effects of the mulch even carried over into the September seeding period. With the mulch balk method the rye winter cover was turned at the normal period along the row area, bedding fashion, and a balk along the row middle was left undisturbed with the rye growing. This was thrown out at the last cultivation of the tobacco and the straw residue scattered along the row middle."

Effect of Previous Cropping Treatment on Runoff - Glenn M. Horner, Pullman, Washington.-"The first appreciable runoff of the current season was caused by melting snow and light rain on frozen soil during the first half of February. Precipitation of 1.71" on February 23 and 24, 1.82" on March 16-19, and .36" on March 21 caused most of the season's erosion damage. The soil on the control plots was not frozen at the time of these three storm periods, therefore, the treatments on the plots were more definitely reflected in the relative amounts of runoff than when the soil was frozen.

"Water losses from the Crop Rotation plots that were seeded to winter wheat in the fall of 1949 are summarized below. These data are for the period from February 23 to March 21.

Cover condition Winter 1949-50	Treatment		Runoff-inches 2/23 - 3/21/50
	Rotation	1949 Crop	
Winter wheat	Alfalfa & grass*	Winter wheat	0.15
"	Alfalfa & grass*	Alfalfa and Grass	0.17
"	Sweetclover*	Sweetclover & grass	0.22
"	Alfalfa & grass*	Peas	0.63
"	Sweetclover*	Peas	0.82
"	Wheat - peas	Peas	1.03
"	Wheat - fallow	Summer fallow	1.26

* Rotation treatments started in 1936 consist of the following cropping sequences: (1) Alfalfa and grass 4 years - winter wheat - winter wheat - peas - winter wheat; (2) Sweetclover and grass 2 years - winter wheat - peas - winter wheat.

"Since these plots had similar vegetal covers of winter wheat, the differences in the amount of runoff reflect the influence of the different rotations on modifying the soil characteristics that affect infiltration. Land that has been cropped to alfalfa or sweetclover rotations had higher rates of infiltration than land cropped to wheat and peas or wheat and summer fallow."

Effect of Various Kinds of Plant Covers on Runoff and Soil Losses, 1949, Guthrie, Oklahoma - Harley A. Daniel, Guthrie, Oklahoma.-"The 1949 crop year was unusually wet and the results in the following table show the effect of various kinds of plant cover on soil and water losses during the severe storm that occurred May 19, 1949. The close-growing cultivated plants that produce protective land cover during the months of heaviest rainfall are especially valuable in conserving soil and water. Sixty percent of the annual precipitation at this station was received during the months of April, May, June, August and September. But an average of 77 percent of the total runoff water was lost during this period. Therefore, thick-growing vegetation and other conservation measures are most effective during the spring and fall months.

Plant Cover ^{1/}	Maximum ^{2/} Storm		Annual ^{3/}	
	Percent Soil Loss Runoff	(T/Acre)	Percent Runoff	Soil Loss (T/Acre)
Continuous cotton	72.54	136.83	27.69	187.22
Cotton crops in rotation	97.45	131.01	30.18	165.13
Wheat	77.08	9.71	21.37	11.07
Sweet clover	32.91	1.68	7.62	2.17
Continuous Bermuda grass	52.83	.57	9.49	.60

- 1/ The heights of the plants were as follows: Cotton, 2 to 4 inches; wheat, 18 to 24 inches; sweet clover, 36 to 42 inches; and Bermuda grass, recently clipped.
- 2/ This storm of 6.32 inches had 5, 15 and 30 minute intensities of 8.04, 4.64 and 3.80 inches per hour, respectively. It occurred on May 19, and followed a storm of the 17th of 1.86 inches.
- 3/ Annual rainfall 46.53 inches, or 14.08 inches above the average.

Management Studies of Sweetclover Residues Growing in 2-Year Rotation with Cotton - J. R. Johnston, Temple, Texas.—"The experiment started in the fall of 1948 on management of oats-sweetclover residue growing in a 2-year rotation with cotton has produced some highly interesting figures. The various methods of residue management (conventional plowing 6-8 inches deep with residues turned under, residues removed and plowed 6-8 inches, or residues removed before plowing and returned afterward) did not differ insofar as their effects on soil and water conservation were concerned. The interesting thing is the effectiveness of the land in absorbing water after the oats-Madrid sweetclover were plowed under. From December 1, 1949 to May 1, 1950 less water was lost from the plowed oats-sweetclover land than was lost from the same land with a winter cover of fall sown oats and sweetclover. Summarized data are shown in table 1.

Table 1.--Rainfall, soil and water loss from Class II Blackland from December 1, 1949 to May 1, 1950.

Land Cover	Rainfall	Runoff	Soil Loss
	Inches	Inches	T/A
Oats-Madrid sweetclover	13.85	0.13	0.08
Plowed land*	13.85	0.07	0.07

* Oats-Madrid sweetclover stubble plowed in November 1949. This land is planted to cotton for 1950.

"Root and top samples taken from Madrid and Evergreen sweetclover seeded at different dates in fall of 1948 and spring of 1949 on April 5, 1950 show approximately the same amount of root development as that present in December 1949. Interpretation of these data indicate that late fall disposition of the sweetclover would be better than waiting until spring

for disposition and seed bed preparation for the next row crop. If the sweetclover could be killed by subsurface tillage in late fall leaving mulch on the soil surface, a good land cover could be maintained while at the same time a good seed bed was being prepared. This possibility is to be studied more closely.

"Detailed data from this sweetclover experiment are shown in Table 2.

Table 2.--Dry matter in the roots of three varieties of sweetclover seeded at six different dates.

Variety	Seeding Date	Pounds of Dry Matter in Roots per acre		
		July 5, 1949	December 19, 1949	April 5, 1950
Huban	9-15-48	328		
"	10-15-48	339		
"	11-15-48	627		
"	2-15-49	536		
"	3-15-49	401		
"	4-15-49	315		
Madrid	9-15-48	1221	1979	1387
"	10-15-48	2046	2725	2098
"	11-15-48	1760	2358	2870
"	2-15-49	1659	2437	1871
"	3-15-49	1066	2244	2496
"	4-15-49	470	1579	2950
Evergreen	9-15-48	1619	2202	2212
"	10-15-48	1613	2092	1868
"	11-15-48	1487	2024	1860
"	2-15-49	914	1803	1622
"	3-15-49	885	1764	1736
"	4-15-49	308	1309	793

Effects of Winter Mulch on Earthworm Population - O. R. Neal, New Brunswick, New Jersey.--"The beneficial effects of earthworm activity on physical conditions of the soil have been pointed out in various reports. The need for winter protection of the soil surface has been emphasized in some of these reports. The data in Table 1 show the spring population of earthworms from cultivated land on the Vegetable Research Farm. The cover crop made poor growth and provided little soil protection.

Table 1.-- Spring earthworm population under different soil treatments

Winter Condition	Average Number worms/sq. ft.	Wt. of worms
		sq. ft. gms.
Bare	3.5	1.8
Cover crop (poor growth)	3	1.0
Mulch	14.5	5.8

"The mulched area was well covered and afforded good protection against rapid temperature changes in the soil. Moisture conditions were less variable and presumably more favorable under the mulch. The number and total weight of earthworms, per unit area, were roughly 4 times as great under the mulch as compared with the bare areas and those of poor winter cover crop. Soil samples were taken for aggregate analysis but the determinations have not been completed. A part of each of the areas will be cropped to potatoes and the remainder to field corn during the coming season.

Soil Aggregation Tests and Air Space Porosity Measurements - "Numerous aggregation tests and porosity samplings on our various soil conservation studies have been completed and are summarized in the following statements:

A. Aggregation Tests:

1. The winter cover of ryegrass and vetch has given much better yields of corn than ryegrass alone. Aggregate analyses show no difference between these. Air space porosities were found to be higher under the ryegrass.

2. Winter wheat was found to be as effective as a straw mulch in preserving aggregate stability.

3. A winter straw mulch cover removed from the soil before plowing gave an increase in aggregation during the growing season. This is not the usual condition and was the opposite effect from plowing the straw under.

4. Aggregation is a sensitive measure of soil physical properties at Marlboro. During 1949 analyses showed that stability was related inversely to cropping intensity as shown:

<u>Cropping System</u>	<u>Aggregation</u>	<u>No. 1 ears corn in 1949</u>
Tomatoes, corn, peas-beans, no special treatment or cover crop	50.6%	6470
Tomatoes, corn, sod, no special treatment or cover crop	58.2%	7740
Tomatoes, corn, peas, cover crops and manure once in rotation	58.9%	8610
Tomatoes, corn, sod, cover crops and manure once in rotation	61.5%	8760

Runoff and erosion losses followed this same order.

B. Air Space Porosity Determinations:

1. The range of air space porosities that might be expected in field soils are as follows:

Freshly plowed sassafras loam at Vegetable Research Farm	42%
Freshly plowed soil at Agronomy Farm	36%
Fall planted wheat land at Vegetable Research Farm	25%
Freshly plowed soil when very wet	22%
Same wheat land when very wet	16%
Grass area on agronomy farm when wet	11.7%

2. Some samplings of interest have shown the following:

a. Blueberry patch, Hammonton, furrow	10.2%
Blueberry patch, Hammonton, ridge	39.0%
b. Apple orchard, mulched trees	12.8%
Apple orchard, grass sod	18.4%
c. Cubberly potato farm, Cranberry, planted, very wet	
High ground	8.7%
Cubberly potato farm, Cranberry, planted, very wet	
Swale	11.7%
Wheat land, Vegetable Research Farm, same day	14.4%
Potato land, Vegetable Research Farm, same day	22.9%

Effect of Pitting and Stubble on Early Growth in Pastures -
O. K. Barnes, Laramie, Wyoming.-"Weather conditions over the plains area in Wyoming were very unfavorable for range and crop development during April. April, 1950, was one of the driest on record.

"Inspections of native pastures on the Station made late in April show some interesting differences in plant growth during this dry period. The pitted pastures, which have about 20 percent lower plant density or cover than the check pastures, show a great deal more current growth. In fact, the check pastures have hardly greened up yet. This marked difference in plant growth appears to be due to fewer plants on the pitted pastures competing for limited supplies of moisture and also to a considerable extent to the greater amount of midgrasses on the pitted pastures which held snow in place during the late winter and affords a better mulch than the check pastures have. The advantage of having a stubble left on the pasture is very evident at this time on all pastures. The heavily utilized pastures gave the appearance of winter in late April, whereas on the light use, there is considerable green forage available. Even on the moderately used pastures where there is any appreciable amount of midgrass stubble, new growth is very evident."

Economic Value of Conservation Farming on a Dairy-Hog Farm in Grant County, Wisconsin.- H. O. Anderson, LaCrosse, Wisconsin.-
"Improved management of the land, with careful attention to soil conservation, means larger crop production. For example, crop yield increases on a dairy-hog farm in Grant County on which records were kept for a period of 17 years, were about 30 percent greater than were the average increases for the county.

Farm A	Pre-soil cons. 1933-36	1937	1938 -41	1942 -45	1946 -49
Corn yields, bu.	40	48	63	63	75
Oats, bu.	30	31	36	56	71
Hay yields, tons.	1.4	2.5	2.5	2.8	1.8
Crop yield index, Farm A*	108	154	170	196	188
Crop yield index, Grant Co.*	100	118	131	153	150
Hay & rotation pasture, %	46%	45%	57%	51%	50%
Soil conservation score	35%	70%	91%	88%	93%

* Grant County 1933-36 average = 100. (Includes corn, oats & hay.)

"The livestock production program on this farm was adjusted from time to time to fit the changing feed supply after the soil conserving program became effective. The number of dairy cows increased from 14 to 18 and hog production from 108 to 162 cwt., or increases of about 90 per cent and 50 per cent, respectively. While purchased feeds increased from six tons to about 15 tons per year, home grown feed roughages, (including pasturage, and grain) provided more than 90 per cent of the feed nutrients

even in the latter years of this study. The ratio of purchased protein supplements to home grown grain was approximately the same in 1946-49 as it had been in 1933-36.

Farm A	Pre-soil cons. 1933-36	1937	1938 - 41	1942 - 45	1946 - 49
Dairy cows, no.	14	13	15	18	18
Hogs produced, cwt.	108	77	131	172	162
Butterfat sold, lbs.	2848	2920	3875	4682	5425
Increase over 1933-36	--	3%	36%	64%	90%
Increase, Grant Co., ave.	--	- 7%	16%	35%	49%

"Both income and expenses rose sharply during the entire period covered by the study, partly due to increased sales and purchases and partly to higher prices. Receipts, however, rose more than expenses with the result that net earnings also continued to rise.

	1933 - 36	1937	1938 - 41	1942 - 45	1946 - 49
<u>Income:</u>					
Dairy	\$1133	\$1586	\$2104	\$4417	\$6275
Hogs	817	615	960	2288	3525
Poultry	149	126	144	481	399
Crop sales & increase	89	776	389	308	264
Miscellaneous	338	389	467	269	250
Total income	\$2526	\$3492	\$4064	\$7763	\$10713
<u>Expenses:</u>					
Feed purchases	\$103	\$292	\$234	\$901	\$1109
Machinery & power	260	130	198	455	918
Livestock expense	70	8	21	85	200
Crop expense	101	346	141	356	654
Labor	316	467	559	1228	1046
Real estate, taxes, & ins.	403	451	416	605	931
Interest on investment	651	687	719	871	1039
Total farm expense	\$1904	\$2381	\$2288	\$4501	\$5897
Operator's labor earnings	622	1111	1776	3262	4816

"On the basis of uniform prices of butterfat and hogs at 70 cents and 10 cents per pound, respectively, receipts for these would have risen 76 percent due to the increased production.

	1933 - 36	1937	1938 - 41	1942 - 45	1946 - 49
Butterfat	\$1994	\$2044	\$2713	\$3277	\$3798
Hogs	1080	770	1310	1720	1620
Total	\$3074	\$2814	\$4023	\$4997	\$5418
% of 1933-36	100	92	138	163	176

"As is shown in the following table, the soil conservation plan for the farm prepared by the farmer and soil conservation specialists was followed quite closely. Three acres of severely eroded cropland was converted into permanent pasture and the balance of the cropland was farmed on the contour. Most of the fields were laid out in contour strips and terraces were built in one field, protecting about 11 acres.

Compliance with soil conservation plan.

Item	Plan		Pre- soil cons. units	1937 units	1938	1942	1946
	units	score			- 41 units	- 45 units	- 49 units
Cropland to permanent pasture, acres	3	60	0	0	3	3	3
Soil cons. crops, %	59	990	46	45	57	51	50
Contour strip cropping, acres	50	400	0	61	50	50	50
Terrace, acres	11	220	0	0	11	11	11
Contour cult., acres	25	100	10	25	25	25	25
Fertilizer, tons	5	150	0	2.2	2.0	2.6	5.4
Lime, tons	20	60	10	10	9	12	17
Past. renovation, acres	7	20	—	—	16	19	19
Total points		2000	700	1404	2815	1761	1860
Conservation score, %		100	35	70	91	88	93

"According to recommendations, hay and rotation pasture should be raised on about 59 per cent of the cropland as compared with about 46 per cent in the pre-conservation period. The acreage of these crops was increased to 57 per cent in the 1938-41 period. During the war years and up through 1949, about one-half of the cropland areas were in hay and rotation pasture. About six acres of permanent blue grass pasture were renovated in 1939-40 and nitrate fertilizers were applied to most of the balance of blue grass pastures. Applications of lime were made as needed for the establishment of legume seedings. Fertilizer applications for grain, hay and corn were increased during the period. Soil conservation specialists consider the overall crop production program will provide adequate protection against excessive soil losses."

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - L. L. Harrold, North Appalachian Experimental Watershed, Coshocton, Ohio.--"The experimental contour fence constructed in the fall of 1947 appears to be in good condition still. The steel posts have pulled in towards the center of curvature and the most of the test sections of fence have lost some tension. The average post deflection at the top has been about 0.05 foot. From one-fourth to one-half of the original tension in the fence lines has been lost. Yet the appearance of the fence is good. The cooperators--a fence company and the Agricultural Engineering Department of the Ohio State University--are pleased with the results to date.

"A report on the contour-fence experiment has been compiled by W. H. Pomerene for State Experiment Station publication. This report includes recommendations for the construction of curved fences--spacing and setting of posts and stretching of wire fence. A general description of the experimental materials and methods is also given along with several illustrations.

"A report on Agricultural Hydrology as measured by the Coshocton lysimeters has been submitted to Washington for publication. This report presents a description of the lysimeters, their construction, a review of recent literature, a summary of accretion and depletion of soil moisture along with evapo-transpiration and condensation-absorption data, a comparison of lysimeter rainfall with recording gage data, hourly gains and losses of water along with air and soil temperature and relative humidity of the air, evaporation pan data, percolation, chemical analysis of the percolate, and a discussion of results."

Hydrologic Studies - R. W. Baird, Blacklands Experimental Watershed, Waco, Texas.--"Total rainfall for the month at Station 69 was 3.65 inches. Following the extremely dry weather of late February, March, and the first 10 days of April this rainfall caused no runoff but did give a recharge to the soil moisture. For the year 1950 we are now about 2 inches below normal rainfall, but, in spite of this, moisture conditions at the present time are better than during the last 2 years.

"Fall seeded Madrid and Hubam sweet clover in combination with oats where phosphate was applied came through the winter and dry spring in good shape, and it looks as if they will more than double the tonnage of green manure to be turned under after oat harvest in comparison to similar areas without phosphate. Both fall and spring applications of ammonium nitrate on oats following corn look as if they will give profitable returns in increased yields at harvest time. Re-established meadows and pastures are responding to phosphate applied last fall. Second year Ky. Fescue 31 and K. R. Bluestem are looking extra good.

"The recent rains recharged most of the areas to field capacity. The percentages of moisture by weight from samples taken on April 19 and 20 at designated depths from corn, cotton, and oat land areas were as follows: 0-6 inches, 32.7 percent; 6-12 inches, 30.3 percent; 12-24 inches, 29.4 percent; 24-36 inches, 29.8 percent; 36-48 inches, 30.6 percent; 48-60 inches, 30.0 percent moisture. These are means for soils with the three different crops in the area with conservation practices.

"Some work has been done on the analysis of soil loss records for Station Y-2. An attempt has been made to work out a relationship between hourly amounts of runoff and the average density for the same hourly period. Although there is a wide spread in the data, a statistically significant relationship has been found. It is hoped that the correlation can be improved by separating these data into different periods of the year or separating storms into different storm types.

Significantly different results have not been obtained by considering the months of April, May, and June, the months when soil losses would be expected to be greatest. Much more work is needed before any conclusions can be drawn on this study."

Hydrologic Studies - J. A. Allis, Central Great Plains Experimental Watershed, Hastings, Nebraska.-"During April considerable progress was made in placing watershed W-5 in conservation practices. With the cooperation of the State and local SCS Operations and the farmers in the area, 24,600 feet of broad-base terraces were built in this area in April. Prior to this spring about 12,000 feet of terraces had been built, making us a grand total of 36,600 feet of terraces built as of the date of April 30, 1950. With the exception of the one farmer who will not cooperate with us at present all the land in the area except that now planted to small grains, alfalfa, and sweet clover has been terraced in this watershed. Roughly a little over 60 percent of the land under agreement is now terraced. Several inspections were made of the grassed waterways in W-5 during the month. The grass is showing up very well and if we have favorable weather most of these waterways will be fairly well established by fall.

"A paper on 'Rainfall and Runoff on the Central Great Plains Experimental Watershed,' by J. A. Allis, was presented before the Mid-Central Meeting of the American Society of Agricultural Engineers, on April 8, at Lincoln, Nebr. The editor of the Journal has accepted this paper for publication in the ASAE Journal."

Hydrologic Studies - N. L. Stoltenberg, LaFayette, Indiana.-"Rainfall for the month averaged 4.93 inches on the Throckmorton Farm which is 141 percent of normal for the month. Rainfall since January 1 is 187 percent of normal.

"The only important runoff period resulted from rainfall totaling 1.40 inches on April 3 and 4. Prior rainfall of 0.59 inch on April 2d had resulted in a small amount of runoff from watershed 14 but no runoff from watershed 15. These watersheds are contiguous, under conservation and prevailing practices, respectively, with a cover of broken down corn stalks from the 1949 corn crop. To date runoff has been computed for watersheds 14 and 15 only. Pertinent data are tabulated below:

	Wsd. 14 conservation	Wsd. 15 Prevailing
Rainfall	1.40 in.	1.40 in.
Rainfall prior to runoff ¹	.21 in.	.62 in.
Runoff ¹	.88 in.	.54 in.
Runoff period	12.02 hr.	10.07 hr.
Peak rate ²	.37 in./hr.	.49 in./hr.
Erosion loss	191 lb./A	298 lb./A.
1. Excluding runoff below 0.1' gage height		
2. Uncorrected for pondage.		

"These data represent a condition of near saturation on Watershed 14. Note that rainfall available for infiltration and surface storage amounts to only 0.52 inch or an average infiltration rate for the period of 0.04 inch per hour.

"The greater than normal rainfall since January 1, has given us an opportunity to observe effects of ground-water conditions. On several of the watersheds with poorer drainage, a portion of the upper 2-3 feet has remained above field capacity up to the present time. A distinction should here be made between internal and

surface drainage. The dominant factor on these watersheds is the internal drainage, although it is evident that each supplements the other.

"On those watersheds with poorer internal drainage, a ground-water table has been noted which has extended in the upper 3 feet of soil during most of the winter and spring. Although we should expect that the above normal rainfall since January 1, has contributed to the adverse ground-water conditions, soil studies indicate that a ground-water table often extends into the upper 3 feet over much of the area. Hydrograph analyses indicate that watershed 14 was in a saturated condition as late as June 13 in 1942 and June 16 in 1945. Under conditions of low transpiration the ground-water table drops less than an inch a day despite the tile drains.

"Alfalfa has been included in the meadow mixture for the conservation treatment in the hope that its roots would penetrate into the subsoil and improve the internal drainage. pF-pore space data from the watersheds with poor internal drainage indicates that the effect, if any, is minor. We have recently noted that the alfalfa in the conservation treatment makes a very poor showing except where the natural internal drainage is good. Apparently, we have been trying to 'pull ourselves up with our bootstraps.' It appears that the use of alfalfa for improvement of internal drainage has severe limitations. Additional tile drainage is indicated on areas with poor internal drainage, if we wish to take advantage of this deep rooted legume.

"We have been concerned that as a result of our conservation practices we have been able to infiltrate so much water during fall and early winter that areas so treated have literally 'filled up.' With internal drainage so slow, the water stored in the soil may be maintained at higher levels than on prevailing treated areas for considerable periods especially if evapo-transpiration rates are low. Although the net annual result of the conservation treatment has always been a decreased runoff with a considerable saving of soil, nevertheless under the above conditions we may get a greater runoff than from areas under prevailing practices. We believe that the conservation treatment would be more effective from the standpoint of flood control if a better system of tile drains were established to reduce soil-water storage more quickly during periods when the soil approaches saturation.

"It has been stated that tile drains contribute to the flood hazard. This idea is in contradiction to our data and experience. Although it may be possible where tile drains are used to drain off water that would otherwise be impounded, such is not the general case. We consider that tile drains in conjunction with the conservation practices used on these watersheds could reduce the flood hazard by maintaining a greater soil reservoir."

• Hydrologic Studies - G. A. Crabb, Jr., East Lansing, Michigan. - "Precipitation for the month of April as measured by the U. S. Weather Bureau standard non-recording raingage amounted to 4.78 inches at the cultivated watersheds, 4.61 inches at the wooded watershed, and 4.05 inches at the stubble-mulch plots. These amounts are approximately 185 percent, 179 percent, and 157 percent of the 50-year average April precipitation of 2.58 inches. April precipitation can be expected to equal or exceed 4.78 inches once in 15 years. There were three run-offs during the month, one at the cultivated watershed 'B' and two at the wooded watershed.

Hydrologic Studies - A. W. Cooper, Auburn, Alabama.-"The April rainfall of 3.73 inches represents 83 percent of the 69-year average of 4.47 inches for Auburn.

"The most revealing results of the month were three tests made to compare soil and water losses from crimson and subterranean clovers on a 15 percent slope.

"The results of the tests (table 1), comparing tests 1 and 3, were that approximately six times as much soil was lost from the crimson clover plot as from the subterranean clover plot, using the same artificial rainfall intensity and duration. The runoff from the subterranean clover plot was slightly more than the crimson clover plot. Test 2 was made on the same plot as test 1 ten days later. The cause for less soil loss than test 1 was probably due to the fact that the loose soil particles had been washed off the plot in test 1. (Table 1 on next page.

"The difference in the type of growth of these two clovers was quite noticeable. The crimson clover had tall individual stems, that left the soil bare between the bases of the plants. The subterranean clover was about two-thirds as tall but made a dense growth on the surface of the soil. Also, as shown in table 1, the dry matter yield of the subterranean clover was almost twice that of the crimson clover (both plots of clover were fertilized and treated the same). It should be pointed out that this is only 1 year's results, and although both crops of clover appeared to be good there might not be as much difference in dry matter yield each year as occurred this year.

"Messrs. Cooper, Thornton, and Conniff accompanied Mr. Sanders, State SCS Drainage Engineer, and Mr. Stephens, State SCS Soil Scientist, on a tour to study irrigation problems in Baldwin, Dallas, and Lowndes Counties. The main problems which the farmers would like answers to are how much water to apply, rate of application, when to start applications, and what type systems to use. The variation in soil physical factors seem to be the greatest problem and the one which the least is known about. It is planned to spend considerable time this summer determining rates of infiltration and available water-holding capacities of soil in Alabama. Six farms were visited. Three had irrigation systems operating, and on the other three the operators were planning to install irrigation equipment."

Hydrologic Studies - T. W. Edminster, Blacksburg, Virginia.-"On April 27, a conference was held which included representatives of the Flood Control Office at Staunton, Va., State Operations Office together with Mr. R. C. Jones, Zone Engineer, to discuss possible sources of information on the infiltration and water-holding capacities of Virginia soils. It was indicated by Messrs. Devereux, Steele, and Wilson that they were receiving innumerable requests for such information in conjunction with irrigation design and in the design of flood-control programs. Mr. Wilson reported that he frequently has requests for the preparation of estimates on infiltration rates of watersheds of 50,000 acres or more. Other requests have been made for infiltration rate values to be included with the soils in the various legends. It was pointed out that Mr. Holtan and Mr. Kirkpatrick had been developing some possible approaches to obtaining the necessary information and that these needs would be discussed with the Washington Office personnel during the first week in May. In the interim, it was decided that Mr. Turner, Soil Scientist, would calculate moisture equivalent data from a number of permeability sites in order to provide some immediately available information.

Table 1.--- Soil and water losses from crimson and subterranean clovers
15 percent slope--Cecil Clay Soil

Test No.	Type of cover	Date of test	Dry matter 3/21/50 lb./acre	Artificial rainfall in./hr.	Duration of rainfall min.	Soil moisture content %	Runoff in.	Soil loss lb./acre
1	Subterranean clover	4/10/50	3,106	3.50	60	23.5	0.9917	348.9
2	Subterranean clover	4/20/50	3,106	3.50	60	25.0	1.2750	102.2
3	Crimson	4/20/50	1,602	3.50	60	23.0	.8926	2,035.7

"Additional conferences were held with Mr. R. C. Jones to discuss methods of getting Holtan and Kirkpatrick's procedure on runoff analysis into a form for field testing, this material was also proposed for final discussion in Washington."

Runoff Studies - N. E. Minshall, Madison, Wisconsin.-"Precipitation at Fennimore as shown by the table below was nearly normal during this period. There was some surface runoff from melting snow but estimates of this have not been made as yet. This has been the worst year since the stations were established in the matter of ice accumulation. Ice accumulated at all stations to a depth of 0.5 to 1 foot above the notch and therefore any computations of runoff must necessarily be rather rough estimates. The temperatures during March and April have been 8 to 9 degrees below the normal and resulted in a very late spring.

Table 1.--Fennimore, Wis., Watersheds

Month	Precipitation		Temperatures	
	Inches		Degrees Fahrenheit	
	Actual	Normal	Mean	Normal
Jan.	1.84	1.12	16	17
Feb.	1.24	1.17	18	19
March	1.30	2.49	24	32
April	3.21	2.88	37	46
	7.59	7.66		

"Precipitation at Edwardsville as shown in the table was above normal for each of the 4 months. The January precipitation was three times normal and nearly two-thirds of this total amount occurred in a 24-hour period on the 3d and 4th. The runoff has been high because of the saturated condition of the soil and dormant vegetation and already totals more than the average annual runoff for those areas. Temperatures have averaged 8 to 9 degrees below normal during March and April.

Table 2.--Edwardsville, Ill., Watersheds

Month	Precipitation		Runoff Inches W-2	Temperature	
	Inches			Degrees Fahrenheit	
	Actual	Normal		Mean	Normal
January	7.68	2.44	7.14	35	31
February	3.01	2.10	2.21	32	33
March	3.70	3.41	1.89	36	44
April	<u>4.44</u>	<u>3.95</u>	<u>1.81</u>	46	55
	18.83	11.90	13.05		

"The operation of the rainfall and runoff stations at Colby, Wis., was resumed during the last part of April. A heavy accumulation of ice in the channel, both above and below the weir, made it impossible to obtain accurate winter measurements of runoff. Ice in the well was 2 feet above notch elevation on April 18. At that time the ice was removed from the well and enough of the pond cleared to place the station in operation. The survey of the drainage area is again under way and will probably be completed during the early summer."

Hydraulic Studies - F. W. Blaisdell, Minneapolis, Minnesota.-"Although Mr. Donnelly concentrated his efforts on the East Aldrich Wingwall Study, he was able to obtain six rating curves for the box inlet drop spillway. It was reported last month that considerable water splashed over the sidewalls of the Morris-Johnson straight drop spillways being tested for the East Aldrich Creek Subwatershed of the Little Sioux River. On April 6, a conference was held with Mr. Edwin Freyburger, Regional Engineer, Region 3; Mr. C. J. Francis, Regional Engineer, Region 5, and Mr. M. M. Culp, Head, National Engineering Standards Unit. Out of this conference came certain recommendations for increasing the sidewall height. The models were modified according to these recommendations.

"The original tests had been conducted on models having scale ratios of 1 to 8. The excessive bank erosion obtained washed the banks completely out of the model channel. In order to obtain geometric similarity, it was necessary to maintain the model banks in place. The scale ratio was therefore reduced to 1 to 12 and a sand selected for the model bed that would be stable at a velocity corresponding to 4 feet per second in the prototype.

"During the month, Mr. Donnelly completed 18 tests on four different models using four different wingwall positions for each model. The data obtained have not been completely analyzed as yet so the results will not be reported in detail. However, it was noted during the tests that:

1. There is considerable scour upstream from the crest of the spillway.
2. With the wingwall perpendicular to the centerline, scour removes much of the material from the downstream side and some of the material from in back of the wingwall.
3. With the wingwall parallel to the centerline, the scour was generally the deepest observed for any wingwall position.
4. Wingwalls with sloping tops and located 30° and 45° with the centerline, gave the best scour pattern.
5. There was little or no scour in back of the wingwalls, except for wave wash at the beach line, for the sloping top wingwalls.
6. The maximum depth of scour occurred along the wingwall for the walls located other than perpendicular to the centerline."

Supplemental Irrigation - J. R. Carreker, Athens, Georgia.-"April was a very dry month, with only 0.54 inch of rainfall. This quantity fell in light showers on 5 days as follows: April 1, 0.08 inch; 4, 0.22 inch; 19, 0.03 inch; 25, 0.15 inch; and 29 0.06 inch. The average rainfall for the month is 3.94 inches. Evaporation from the pan amounted to 5.74 inches. Wind movement totaled 1,758 miles. Temperatures were lower than normal for the first 3 weeks with below freezing readings on the mornings of April 7, 8, 14, 15, 16, 21, and 22. High readings of 90 were recorded on 5 days of the last week. Atmospheric relative humidity was quite low in the daytime during most of the month.

"The fescue and Ladino clover in one-half of the winter pasture was irrigated with 1 inch on April 24. The sprinkler irrigated corn plots were irrigated with 0.75 inch on April 27 to insure a stand. A fescue grass-Ladino clover pasture on the University Dairy Farm was being irrigated with our equipment at the end of the month."

Supplemental Irrigation in Virginia Agricultural Production - T. W. Edminster, Blacksburg, Virginia.-"The total rainfall for the month at the irrigation plots was 1.93 inches with approximately 0.9 inch on the last day of the month. Both the control plot system and the pasture system were operated as soon

as the units could be set up in the field. Part circle sprinklers were operated on the control plots and worked fine, giving uniform coverage when not affected by the wind. On all of the 23 plots to receive irrigation an application of 1 inch was made on April 24. In accordance with the soil-moisture depletion study, the alfalfa plots were given another application of 1 inch on April 28.

"The corn and burley plots have been plowed and the corn plots were prepared for planting.

"The pasture unit was set up with a change in the position of the main to reduce pressure losses. The main which operated across the lower edge of the two irrigated lots last year was moved to the top of the slope and the lateral operated from a tee instead of an elbow. Aluminum pipe replaced Calco pipe used last season for the lateral. Seventeen sprinklers were again used with varying size nozzle tips to aid in producing a uniform coverage despite pressure variations due to differences in elevation.

"An application of 1-1/2 inches for the two irrigated lots was begun on April 25. As only two settings could be obtained daily, 10 out of the 18 positions were irrigated before the rain on April 30.

"Both revised systems operated very satisfactorily and will be operated when deemed necessary."

Drainage Studies - I. L. Saveson, Baton Rouge, Louisiana.-"Spring work has been somewhat delayed due to wet weather and most of the plantations are approximately 30 days behind on their work. During this period we have carried on a number of field trials with the experimental trencher. This is a wheel trencher equipped with power side cutters for sloping banks, and a high speed impeller for spreading the earth. On this machine, we are working with one of the trencher manufacturers at their request. We ran some trials with this machine with stationary side cutting blades last fall, and in these trials we found the blades did not handle trash and would eventually choke up. The wheel had a three point suspension and the bottom roller interfered with the dirt moving into the wheel which was cut by the sloping attachment.

"This past winter the manufacturer had sent us an experimental power sloping attachment and a four point suspension for the wheel. This machine does a beautiful job of cutting a ditch; however, there are still several difficulties which the manufacturer is now in the process of correcting. The conveyor is too light to handle all of the earth since the sloping of the banks increases the volume considerably. In the soft earth when cleaning the ditch bottoms we are finding these buckets will not cut trash and is causing it to hairpin. We have constructed here on the project a number of striking bars which seem to keep the buckets clean and which has helped considerably since the earth moves at a more uniform rate. The factory engineer was here during some of the trial runs and they contemplate redesigning the conveyor. This machine will clean sugarcane ditches under the best conditions at approximately 18 feet per minute. Under adverse conditions, 11 feet per minute.

"As soon as the redesigned parts are received we will probably make some additional shearing bars on the side cutters and cleaners in order to facilitate handling the trash. We are now in the process of moving equipment into the field to start the season's work on grading land for drainage. We have a 40-acre test area under way on St. Delphine Plantation, Addis, La."

Drainage Studies - M. H. Gallatin, Homestead, Florida.-"Readings following the rains of April 5 at gage 2 totaling 2.47 inches showed that the natural cover, check, pine straw, and grass mulched plots were all low, while there was little or no change in the readings in the shavings mulched area until a day later. We have found that heavy showers of short duration do not penetrate the shavings.

"We have again had a chance to check our previous moisture findings. On April 5 and 6, 1.45 inches of rain were recorded at gage No. 7. Moisture blocks in this area showed that 6 days later the trees were approaching the wilting point. Our soils will not absorb more than an inch of rain, the remainder passes through as shown by our water-table studies.

"During this period we had 2 days in which rather heavy rains occurred. In groves where low organic fertilizers were used the losses of nitrate nitrogen were high. Groves where higher organic fertilizers were used lost the available portion but there was enough reserve nitrogen that these areas again built up. Our studies to date show that during the winter months, November through April, low analysis fertilizers of 30 percent organic will last as long as those having a higher analysis of 50 percent or more.

"During the latter part of this period we have had a drag line working at the Highlands water-control plot cleaning out the ditches and putting a side slope on the ditches. When these ditches were dug, all information we had indicated the marl ditches would stand up without putting a side slope on them. We found later that working close to them with wheeled equipment the marl would crack and later during summer rains would slough off cutting down on the efficiency of the ditch."

Drainage Studies - J. C. Stephens, West Palm Beach, Florida.-"At the request of the Zone Engineer and District Conservationist, a trip was made to Arcadia, Fla., the first part of the month to help in setting up a field trial to determine methods and results of pasture irrigation on sandy soils from artesian wells using surface irrigation. Surplus rain gages and a water-stage recorder were loaned for this work and the facilities of this project will be available to the District conducting the trial in analyzing and correlating the information collected whenever time is available. Approximately 1 week later our project was visited by Mr. Dave Powell, Soil Survey Supervisor, who has done considerable work over the State on determination of soil permeability. Permeability studies made by the project and those made by the soils men were discussed and information exchanged. Mr. Powell agreed to make the permeability tests as soon as the opportunity arises on different horizons of organic soils which have undergone different cultural practices to determine the effect on internal drainage. Certain aerial photographs showing the original soil survey of the Everglades Drainage District were loaned to Mr. Powell for the District. These have been photostated and returned to our files. This is expected to decrease the expense of resurveying some of the cooperating ranches and farms in parts of Glades and Hendry Counties.

"A conference was attended which was held by the Engineering Division of the Flood Control District with the U. S. Geological Survey relative to the ground and surface water-survey program within the District for the coming year. It was agreed that the present program of the Survey would be only slightly expanded during the next year pending more definite information on the future program of the U. S. E. D. on the collection of hydrologic data. It was agreed that the U. S. G. S. and this project would informally cooperate in the collection of data within the Lake Worth Drainage District designed to furnish information in estimating drainage

and irrigation requirements of the soil types prevalent in the Lake Worth District. Irrigation and drainage pumps operated by the District will be rated by this project and other flow measurements will be made by the U.S.G.S.

"Another meeting was held in Belle Glade attended by the Director and staff members of the Experiment Station, the Assistant Engineer of the Flood Control District, and the Project Supervisor, relative to investigations of the critical flooding periods for common plants now grown, and also for those proposed for agriculture in the Everglades. This information is needed to assist in establishing design criteria for drainage systems in the District. It was agreed by the majority of those present that tank studies would yield more immediate information on this subject at less expense than other proposed methods, and that the tanks also had an advantage in that they could later be converted to use in water-consumption studies. It was preliminarily estimated that a contribution of from \$3500 to \$4,000 by the District for this study would be needed. The Project Supervisor was requested to prepare more detailed plans and costs for submission to the District Engineer, which, if approved, would be submitted to the Board of Governors of the Flood Control District for consideration.

"A resurvey of the Dade-Broward Levee was made by Dade County in late March and early April of this year. The profile made from the survey was given to the project and comparison was made with the profile taken from the cross sections of the levee made in October 1948, when initial compaction had taken place after re-construction of the levee.

"The levee is approximately 40 feet wide at the base, 12 feet along the crown, and 6 to 7 feet high. The present levee was constructed in the summer of 1948 after a smaller levee had been overtopped and partially destroyed by the flood of 1947. It was built over the remaining portion of the original levee by raising the crest elevation to about twice the elevation of the old dike. The original levee was capped with from 6 to 18 inches of hard limestone and where it was not washed away remains in place near the center of the present levee.

"Last year surveys made in April for a distance of 1 mile on both ends of the levee showed that an average subsidence of 0.29 foot along the crown had occurred over the mile on the north end, and 0.22 foot over the mile at the south end.

"This year's survey shows that the average settlement since 1948 amounts to 0.44 foot for the entire length of levee. Crest subsidence has been figured for six different reaches of the levee to determine the effect of different construction methods and maintenance practices along the different levee sections. For example, the last stretch from about 11.4 miles to 13.8 miles was built up by dumping crushed limestone along the crown during the last few months. The stone was hauled in place by heavily loaded Athey wagons using the crown of the levee as a roadway, building from north to south. It will be noted from the table below that any increase in height from placement of the stone cap has been offset by a corresponding loss of elevation due to compaction of the peat, however, the value of the levee as a flood barrier has been increased over this reach, and it is possible that the rock cap will tend to seal off air circulation so that future subsidence will be lessened. Tabulated below are the results of the 1948 and 1950 surveys. Distance cited is from Tamiami Trail north of Miami canal:

Distance north:	0.0 mi.:	1.9 mi.:	3.8 mi.:	6.1 mi.:	7.7 mi.:	11.4 mi.:	Avg. along
from Trail	:1.9 mi.:	:3.8 mi.:	:6.1 mi.:	:7.7 mi.:	:11.4 mi.:	:13.8 mi.:	tot. length
Avg. crest. elev.	11.41	11.81	12.03	12.10	12.94	12.82	12.30
October, 1948							
Avg. crest. elev.	11.03	11.57	11.57	11.70	12.40	12.30	11.86
April, 1950							
Avg. loss in	.38	.24	.46	.40	.54	.52	.44
elev. in feet							

"In February 1944, a steel tank 10.5 feet in diameter and 7.5 feet deep was set in the ground and soil banked around the outside to within several inches of the top. The water level in the tank was kept to within a few inches of the top. Daily records of the evaporation from this tank have been kept continuously, and a 6-year record is now available. Experiments from other sections of the country indicate that evaporation rates from the 10.5-foot tank should closely follow those from ponds and large open bodies of water. Evaporation losses from this tank are herewith compared to losses obtained from a nearby standard Weather Bureau pan to establish the ratio or standard pan coefficient which can be used in estimating reservoir evaporation from pan records. Also tabulated is the mean monthly temperature from which temperature loops have been prepared.

Table 1.--Hydrologic data obtained at Everglades Experiment Station near Belle Glade, Fla.

Period March 1944 Through February 1950

Month	Evaporation open pan	Evaporation 10.5 ft. land tank	Ratio	Mean monthly temperature
January	3.278	2.928	0.89	66.0
February	3.972	3.570	.90	65.9
March	5.901	4.887	.83	69.4
April	6.682	5.609	.84	73.7
May	6.947	5.986	.86	75.2
June	6.249	5.431	.87	79.1
July	5.888	5.149	.87	80.1
August	6.223	5.226	.84	81.5
September	5.444	4.673	.86	78.9
October	4.735	4.503	.95	75.8
November	3.725	3.684	.99	70.4
December	3.201	3.009	.94	66.6
Average (year)	62.245	54.655	.88	

"At present coefficients ranging from 0.70 to 0.75 are applied to standard open pan losses by most agencies in estimating open water-evaporation losses in Florida. Apparently, these coefficients have been derived from experiments conducted in Western States where the relative humidity is lower than in the Everglades. These experiments, plus consideration of the results obtained at Denver, Colo., and Fullerton, Calif., indicate that as the mean relative humidity increases, the evaporation coefficients also increase. The reduction coefficient established at Melford, Utah, was 0.67; at Denver and Ft. Collins, Colo., 0.70, at Fullerton and Lake Elsinore, Calif., 0.77, and at Belle Glade, Fla., 0.88. The mean humidity at the Utah and Colorado Stations are not known, although it must be considerably lower than the 67 percent quoted for Fullerton. Records show the relative humidity at Belle Glade is very high, being usually from 100 percent from sunset to

about 9:00 a. m. Since the higher temperature of the water in the standard pan is presumed to be the major factor in producing evaporation of a higher rate than from the large land pans and reservoirs, it is logical to also assume that factors which tend to reduce the effect of higher temperature on evaporation would reduce the difference in evaporation between the two; i. e., raise the reduction coefficient. Young cites the study showing that the evaporation for Berkeley, Calif., is less for the same average temperature than at Soldiers Camp because of the higher humidity of the coastal area as compared to the desert influence at Soldiers Camp. At 70 degrees F. the daily evaporation was approximately 0.23 inch compared to approximately 0.42 inch at Soldiers Camp.

"The temperature loops in figure 1 (copy can be obtained from project) which have been plotted to show the relation of mean air temperature to mean evaporation to large sunken land pans compares the Fullerton and Belle Glade results. It will be noted that evaporation in Belle Glade is considerably lower for the same temperature range than at Fullerton, presumably due to the subduing effect of the higher humidity at Belle Glade. Thus it appears reasonable to expect a higher reduction coefficient under the climatic conditions prevailing in the humid 'Glades, compared to western climatic conditions.

"In view of the fact that the ground-pan factor used in the Belle Glade study was possibly slightly less than unity since it was 10.5 feet in diameter as compared with the 12-foot pans ordinarily used in establishing reduction coefficient; and also due to the fact that the rainfall and relative humidity during the 6-year study period was somewhat above average during which the coefficient of 0.88 was obtained, it is believed that an annual reduction coefficient of 0.85 for the standard pan, in average years, can be recommended by the Soil Conservation Service for use in South Florida."

WATER CONSERVATION AND IRRIGATION DIVISION

Plot Intallation - S. J. Mech, Prosser, Washington.--"The month was devoted almost exclusively to the installation of plot equipment and the preparation for corn planting. Application and runoff equipment was installed on the 36 plots. The usual irrigations before the planting of corn were almost completed when the concrete pipe below the pump house blew out. This failure will delay our planting about 4 days, but it is expected to have the corn in the ground by May 10.

"Part of our application installation was new Quick Coupling Lock pipe. Instead of having a drive fit, it has a rubber gasket and a locking device. This new pipe worked exceedingly well. The joints leaked less than the drive-fit pipe, and the elimination of the need for driving permitted the gates to remain lock-proof. Driving had a tendency to spring the gates on the drive-fit pipe. Repeated driving also caused some pipes to collapse."

Irrigation Studies - N. P. Swanson, Amarillo, Texas.--"Preplanting irrigations for cotton had been made on most of the irrigated farms on the southern portion of the High Plains by the end of the month. A year ago, following favorable winter and early spring precipitation, less than 50 percent of these farmers had used their irrigation pumping equipment.

"Precipitation in April totaled 0.38 inch, bringing this year's total to 0.71 inch. Precipitation is now 4.4 inches below normal for the past 7 months with a total of 2.32 inches during this period.

"Five-inch irrigation applications have been completed on plots to be seeded to alfalfa and sweet clover this spring."

Irrigation Studies - B. Tomlinson, Laramie, Wyoming.--"Two meetings were held with the U. S. Bureau of Reclamation, Wyoming Agricultural Experiment Station, Bureau of Plant Industry, Soils, and Agricultural Engineering, and the Division of Irrigation of the Soil Conservation Service to discuss and outline plans for operation of a development farm at Riverton, Wyo. One meeting was held at Riverton and one at Laramie, Wyo., to work out details for this program.

"A meeting was also held at Ft. Collins, Colo., between the Bureau of Plant Industry, Soils, and Agricultural Engineering, the Erosion Control Practices Division, and the Division of Irrigation of the Soil Conservation Service to discuss the coming operation of the Mountain Meadow Projects in Wyoming. The Wyoming Agricultural Experiment Station personnel were invited to this meeting but declined to attend.

"Tillage work was also started on the Pinedale, Wyo., mountain meadow site, Wooden structures were also fabricated at Laramie for hauling to Pinedale.

"Additional work was also accomplished on the consumptive use study for Wyoming and the 1949 progress report for the Pinedale Mountain Meadow Project."

Irrigation Water Management and Drainage Practices in the Production of Hay and Forage in the High Mountain Valleys of Colorado.-- H. K. Rouse, Gunnison, Colo.--"An unusually warm, dry spell late in March and early in April melted the snows in the mountain valleys a full month earlier than had been anticipated and strong winds dried out the topsoil of all the meadows except the lowest levels which are subject to overflow.

"It has been necessary to rush work on the factorial plot experiment on the Blackstock ranch in order to be prepared to irrigate at the earlier date. This experiment is planned to investigate four irrigation practices, two types of vegetative cover, eight fertilizer trials and two times of cutting hay. The experiment will be carried out in four replications making a total of 256 sub plots to be prepared and 768 separate harvestings.

"As a result of an outstanding example of community interest and cooperation, it has been possible to prepare the plots and deposit fertilizer and seed at this time. All needed equipment is on order and delivery promised in time to meet the irrigation requirements.

"Plans for the project require the enclosure of 16 plots with low earthen dikes. Approximately 6,000 lin. feet of dike, requiring over 250 cubic yards of dirt was involved. Because of the soft type of meadow and our desire to avoid damage to vegetation, the usual type of dump truck operation was inadvisable. It was thought that only the lightest equipment should be used. An appeal was made to local ranchers to bring their jeeps and light two-wheel trailers to assist in the work, and the dates of April 20 and 21, were set. The County Commissioners provided a dirt loader and small truck, and seven jeep outfits were provided by interested local ranchers. In addition, the County Extension Agent, the Assistant Supervisor of the Gunnison National Forest and Three men from SCS-Operations assisted on the business-end of shovels to unload and distribute the dirt. At 5:00 p. m. on April 20, the ranchers suggested that they keep at the job until dark and finish it. And finish it that day they did, although not until after 8:00 p. m. in total darkness with only the head lights of the jeeps and a few cars to guide them.

"This plot experiment is planned as the major effort of this calendar year, and the investigations include the following:

Irrigation Practices (Plots 60' x 120')

- A. Usual local practice (approaches continuous flooding)
- B. Surface irrigation at about 2-week intervals
- C. Surface irrigation at about 3-week intervals
- D. Sprinkler irrigation, governed by tensiometer readings

Vegetative Cover (Plots 56' x 50')

- I. Present native grasses and sedges
- II. Present vegetation seeded to a mixture of three clovers
(seeding completed April 26)

Fertilizer trials (Plots 14' x 25')

1. check
2. Nitrogen N_1 , 40 lb. N per acre in 2 applications
3. Nitrogen N_2 , 80 lb N per acre in 2 applications
4. Nitrogen N_3 , 160 lb N per acre in 2 applications
5. Nitrogen-Phosphorous, N_3 plus 100 lb P_{2O_5} per acre
6. Nitrogen-Phosphorous, N_3 plus 200 lb P_{2O_5} per acre
7. Nitrogen-Phosphorous, N_3 plus 400 lb P_{2O_5} per acre
8. Phosphorous, 200 lb P_{2O_5} per acre.

Half of the nitrogen and all the phosphorous was applied during week ending April 22. Remainder of nitrogen fertilizer is to be applied during week ending June 3.

Time of Harvest Trials (Plots 7' x 25')

- a. Harvest about July 15, when protein and vitamin content is near maximum.
- b. Harvest in accordance with local practice about August 15 to September 1, and check aftermath growth on "a" plots."

Irrigation studies - E. W. Cowley, Grand Junction, Colorado.-"Specifications were revised and an Invitation to Bid on drilling of test wells for drainage studies was issued by the County Commissioners. The lowest bid received exceeded the County budget for this work so all bids were rejected. Work on this project will be continued.

"Plans have been completed for the installation of an irrigation system on experimental plots. Gated pipe will be used to distribute water to corrugations and furrows. Final installation should be completed shortly after arrival of the pipe, which is expected about May 5.

"Plans for measuring water on off-station farms, in connection with irrigation efficiency studies, are nearly completed and equipment will be installed upon arrival probably the first week in May."

Surface and Sprinkler Irrigation Studies - W. D. Criddle, Boise, Idaho.-"Under the direction of Sterling Davis, the surface and sprinkler irrigation studies on the Black Canyon experimental plots have progressed well during the month of April. These plots were planted to barley and the crop is well up. With the heavy rainstorm occurring at the end of April, it is anticipated that good growth will occur without irrigation until the middle of May.

"The surface irrigation plots being studied this year have a slope of 5 percent and 0.5 percent, respectively. The 0.5 percent corrugations were laid out on the contour. Careful studies are being made of the intake rates and erosion that occurs due to irrigation on these two slopes. A new plot with an area of 120 feet by 120 feet, having a slope of 10 percent, was broken out of sagebrush this year and planted to barley.

"In connection with the sprinkler studies, it is felt desirable to determine what sprinkler rates may be safely applied on these soils with such a high slope. In addition to the above work, three acres were broken out of sagebrush on an area having extremely heavy alkali conditions. This latter area has been planted to barley and will be farmed for this first year with a view towards making intensive slick spot studies in future years.

Consumptive use of Water Studies-"On April 26, Mr. Criddle presented a paper entitled, 'Consumptive Use of Water on Irrigated Lands' at the spring meeting of the American Society of Civil Engineers in Los Angeles. This subject is of vital importance, particularly in the Southwest area where short water supplies must be fully utilized. The divisions of the Colorado River waters by the seven basin States and Mexico are on a basis of consumptive use and stream-flow depletion.

"A final revision was made in the manuscript entitled, 'Determining Water Requirements in Irrigated Areas from Climatological and Irrigation Data,' by Harry F. Blaney and W. D. Criddle. This manuscript is now in the hands of the Department of Agriculture Editor in Washington, D. C., and should be released as a technical publication in the near future.

Miscellaneous-"Under the publication program of the Soil Conservation Service, U. S. Department of Agriculture, a series of bulletins are to be prepared and published at various times during the next 3 or 4 years. This past month three of these proposed bulletins were worked on. A manuscript which is being prepared for a farmers' bulletin entitled, 'Irrigation of Corn' was reviewed rather critically and suggestions made for revising it. Two other proposed bulletins were worked on. An outline was prepared for a farmers' bulletin on irrigation of alfalfa and

also one for irrigation of beans. It is anticipated that some time will be required to complete the preparation of these bulletins. But, in the meantime there is an attempt being made to gather the best information available on these subjects and to supplement existing data where felt necessary."

Irrigation Studies - P. E. Ross, Weslaco, Texas.-"Permeability studies were continued on the J. F. Martin soil. Two significant observations have been made. First, the plow sole effected by regular tillage operations seems more effective in preventing the passage of water into the sub-soil than was generally believed. The undisturbed soil core taken from the 4 to 9-inch depth required 10 times the length of time for the water to pass through the core than the core taken 14 to 19 inches required. The permeability of the 4 to 9-inch core leveled out, however, to about one-fourth of that of the 14 to 19-inch core. This should be of major importance to farmers in tillage operations and in considering soil improving crops.

"The second item of significance was the exceptionally dense clay lens at 58 to 66 inches. The permeability of this lens was found to be only one-fortieth of that of the soil at 72 to 80 inches. Barriers such as these have been found over much of the Valley with soil augers, and were observed in a disturbed state. However, such an extreme variation in permeability was not anticipated.

"A cooperative study of citrus irrigation was set up on Rio Farms by Bloodworth and me this month. Total consumptive use and seasonal rate of use of water will be measured. The effect of different moisture levels on yield will be studied. Irrigation efficiencies will be measured. Tensiometers will be used as a guide for irrigation after they have been calibrated to indicate the soil-moisture percentages. Basic soil information; i. e., volume weights, field capacities, and wilting points of the soils are now being taken. The wilting point for this soil unit 7 has been found to be 6.2 percent for the first foot and 7.9 percent for the second foot.

"The outlying cotton plot on the H. J. Garrett farm was irrigated during the last few days of the month and an irrigation efficiency study of the plots on the field was made. Data on this study will be worked up in the near future."

Friction Losses in Pipes and Fittings - C. Rohwer, Ft. Collins, Colorado.-"Arrangements have been made to have the report on Friction Losses in Selected Valves and Fittings for Irrigation Pumping Plants published as a Station Technical Bulletin. The Editor is putting the manuscript in final form for the Printer. It is hoped that no further difficulties in getting the report printed will be encountered."

Performance Tests of Well Screens - C. Rohwer, Ft. Collins, Colorado.-"The hoist for handling the gravel and sand for the well screen tests was completed and placed in operation. In order to operate the motor on the hoist, a 440-volt power line had to be built in the Laboratory. This equipment is working satisfactorily. Mr. Jack Peterson conducted tests on the head losses through screens when surrounded by gravel envelopes of 1/8- and 1/17-inch gravel. Gravel envelopes of this fine material can be used only with screens having small slot openings. The tests show that these screens have a tendency to clog. Tests on a No. 20 Johnson screen when surrounded by 1-inch gravel showed the same tendency because the fine particles broken off the gravel by handling it, caught in the slot openings. Some improvement in the loss readings are being obtained by more frequent screening of the gravel to remove the fine particles."

Seepage Losses from Irrigation Channels - C. Rohwer, Ft. Collins, Colorado

"A progress report on last season's work on this project has been completed except the assembly of the pages. It will soon be ready for distribution. This study shows that seepage under controlled conditions is not constant but varies from day to day. These variations may overshadow the effect of changes of depth of water. The tests of the SCS permeameter show that satisfactory measurements of seepage can be made with the device if proper precautions are used in driving the bell into the soil. Jarring the bell tends to puddle the soil.

"Equipment is being reinstalled in the seepage rings at the Horticultural Plot on the campus for continuing the observations on seepage. Water was turned into the pools on April 28. The high rate of seepage noted last fall for this soil is again taking place. A 3/4-inch pipe-line was laid to replace the hose formerly used to supply water for the rings and a new hydrant was installed. Equipment has been purchased or built for another set of seepage rings to be installed in sandy soil at the Hydraulic Laboratory at Bellvue.

"Mr. Ralph Rollins, cooperative agent, made tests of the permeability of the soil at the Horticultural Plot and built apparatus for testing the permeability of undisturbed samples of the soil. Mr. Paul Weaver has been employed on a WAE basis to assist on the seepage project."

Irrigation Studies - E. G. Hanson, State College, New Mexico.--"The college plots have been planted for consumptive use and irrigation frequency studies with alfalfa and cotton. Soil sampling has also been commenced on the sites on private farms where irrigation trials are to be made. Bouyoucos blocks together with soil sampling are to be used to follow the march of moisture on the college plots.

"The graphs (a copy can be obtained from the project) and table summarize the results of a Bouyoucos block calibration trial in soil samples prepared as indicated in the table. The calibration was done by placing each Bouyoucos block in a quart-size can containing 1,000 grams of soil to which 40 percent water was added simulating approximate field capacity. A sunflower was grown in each sample and as the water was depleted from the soil, the samples were weighed and the block resistances were read periodically thus providing data to plot the graphs. Part of the variation in the shape and positions of the curves may be attributed to slight differences in the Bouyoucos blocks which were made locally. However, each individual block will be calibrated to the soil in the field where it is to be placed and the curve for each block and soil will be used in determining moisture content from resistance readings

"The table shows that the wilting percentage varied from 12.8 percent to 17.1 percent. The largest variation in wilting percentage occurred in the 'baked and ground' samples; the smallest in the 'field dried and ground' samples. The replicates are not sufficient to attach statistical significance to this observation. The wilting percentage was established for each plant as the point where a break occurred in a curve formed by plotting water loss (in grams) against time (in days). This break occurred about 1 day before the basal leaves had a definite wilted appearance and represents a change or decrease of water consumption from about 10-20 grams per day to 2-3 grams per day.

"The table appears on the next page.

Table 1.--Results of direct calibration of Bouyoucos blocks to soil planted with a sunflower.

Block No.	At wilting percentage		Soil preparation
	Moist %	Res. (ohms)	
8	13.0	7,000	Baked and ground
31	15.9	15,000	" " "
32	16.9	17,000	" " "
35	12.8	25,000	" "
80	16.1	24,000	Field dried and ground
97	16.3	17,000	" " " "
88	16.2	135,000	" " " "
96	16.6	26,000	" " " "
97	14.0	55,000	Field dried and screened
98	17.1	16,500	" " " "
103	15.7	26,000	" " " "
108	16.7	39,000	" " " "

"The soil was prepared in three categories: (1) by baking the soil 24 hours at 110° C. and grinding, (2) by grinding field-dried soil, and (3) by screening field-dried soil."

Irrigation Studies - W. R. Meyer, Garden City, Kansas.--"The beet ground was worked during the first part of the month and the beets to be irrigated at 60 percent available moisture in the first foot were planted on April 13. Part of these were irrigated on April 15 and on Saturday night, April 15, it rained 0.98 of an inch so the rest of them did not have to be irrigated. The rest of the beets were planted on April 22 and did not have to be irrigated up, due to sufficient moisture in the soil. The beets are up now and looking pretty good, however, they have not grown much due to cool weather. Three hundred pounds of super phosphate was applied with the beets at seeding time.

"Water-stage recorders have been received and a few changes have been made to get a more accurate reading on the small Parshall flumes. The building at the irrigation project was wired and the soil oven was installed. Soil-moisture cans were received and were lacquered and brought to constant weight.

Irrigation Studies - C. E. Houston, Reno, Nevada.--"At the request of the State Engineer and while en route to scheduled forecast meeting in Elko, Nevada, 1 day was spent in O'Neill Basin in northeastern Nevada to advise the State Engineer, various ranchers, and Salmon River Canal Company on the need for consumptive use studies in that area. The Salmon River Canal Company of Idaho is interested in determining the amount of water used by irrigating ranchers on the upper reaches of Little Salmon Falls Creek. The State Engineer is operating gaging stations in the area to determine the water applied to Nevada ranches and the amount running off. After visiting the area with the interested parties, we felt that their present desires are satisfied by use of the water-measuring devices but that should they desire additional information concerning consumptive use of different crops and irrigation efficiencies, then we would be ready to enter an agreement to carry on some work.

"Six local forecast meetings were again held in irrigating communities throughout the State. All together there were about 100 interested farmers and technicians in attendance. Snow surveys on over 100 courses in Nevada show that 1950 snow water runoff will vary from 80 to 115 percent of normal in the Eastern Sierra

while Humboldt Basin streams will flow from 65 to 115 percent. The southern two-thirds of the State can expect very little snow-melt water as snow surveys indicate that during the past winter many areas received their lowest recorded snow-fall."

Rainfall and Irrigation Water Penetration - D. C. Muckel, Pomona, California.-"The second progress report on cooperative studies with San Bernardino County Flood Control District was completed during the month. It was entitled, 'Progress Report - Rainfall and Irrigation Water Penetration and Consumptive Use in the Beaumont-Yucaipa Area, Santa Ana River Valley, California.' Data were presented on transpiration by various irrigated, non-irrigated, and native plants; initial fall moisture deficiency; penetration of rainfall; and deep penetration of irrigation water. Average amount of deep penetration for various irrigation crops were presented for a normal season and deep penetration of rainfall was presented for various land classifications by years for the period 1927-28 to 1947-48, inclusive. Land classifications or crop data as determined by the California State Division of Water Resources were used in setting up the unit values. Quantitative values of irrigation and rainfall penetration were determined by multiplying the units as therein presented by the acreages of the various land classifications as determined by the California State Division of Water Resources. Deep penetration of rainfall varied considerably from year to year. Annual maximum, minimum, and average amounts for the period 1927-28 to 1947-48 inclusive were found to be as follows:

	<u>Yucaipa</u> <u>(Area - 17,529 acres)</u>	<u>Beaumont</u> <u>(Area - 18,558 acres)</u>
	<u>Acre-feet</u>	<u>Acre-feet</u>
Maximum during period	17,114	18,086
Minimum during period	181	346
Average	4,013	4,414

"The average annual deep penetration including both rainfall and irrigation amounte to 4,748 acre-feet and 4,950 acre-feet for Yucaipa and Beaumont areas respectively. The average for the 5-year period ending with the 1947-48 season, was only 41 percent of the long-time average and for the 3-year period ending with the 1947-48 season only 21 percent of the long-time average."

Imperial Valley Drainage Investigations - G. B. Bradshaw, Imperial, California.-"During successive runs on leaching studies of ponded water over tile drainage systems a marked decrease in tile drainage effluent has been noted in the 2d, 3d, and 4th leaching runs. This decrease in drainage discharge has been attributed to the deflocculation and segregation of the surface soil by the ponded leaching water. The wave action of the leach water has evidently helped break down the soil as well as segregate it. This deflocculated surface condition is more pronounced on the edges of the ponds and in the surface 3/4 inch. There are two distinct deflocculated layers: surface 3/4 inch and a semi-deflocculated layer of about 2 inches."

"The following tabulation gives some characteristics of the deflocculated surface condition following four successive leaching runs of 30, 44, 74, and 48 days. Sample Station A is on the edge, and B is in the center of a leach pond.

Bouyoucos analysis of soil

	<u>Station A</u>			<u>Station B</u>		
	3/4-inch crust	2-inch layer	Below 2 inches	3/4-inch crust	2-inch layer	Below 2 inches
Silt, percent	40	40	38	42	30	32
Clay, percent	27	7	6	7	6	8
Colloidal clay, percent	28	43	44	39	45	41

Permeability at Station B

	<u>C.C./sq. cm./hr.</u>	<u>Gal. /sq. ft./day</u>
3/4-inch surface crust	0.028	0.14
2-inch semi-deflocculated layer	.056	.28
Below 2-inch semi-deflocculated layer	.165	.82

"The above tabulation indicates there was some movement of clay by the water action and that some colloidal clay was washed away in the surface waste water.

"A study is being made to determine the effect upon in the infiltration rate due to disking and working of the surface between leaching runs."

Irrigation Requirements - G. M. Litz, Los Angeles, California.-"In connection with requirement studies with H. F. Blaney, the monthly percent of annual daytime hours were calculated for each degree of latitude from 0 to 20 degrees north of the equator. From this date and the table of monthly percent of annual daytime hours for latitudes 20 to 50 degrees north now in use, a graph was drawn which shows the percent of daytime hours for each month of the year for each one-fourth degree of latitude from 0 to 50 degrees north. A similar graph was prepared for reproduction that gives these values from 15 to 50 degrees north latitude, a range that will include Mexico, the United States, and a portion of southern Canada."

Water Conservation - Tehachapi Soil Conservation District - W. W. Donnan, Los Angeles, California.-"At the request of the Tehachapi Soil Conservation District, a field reconnaissance was made of the valley floor area with Charles Thomas, Engineer for the Operations to get acquainted with some of the problems of water conservation and irrigation. About 25,000 acres of this area are now being irrigated by pumping, early summer runoff, and springs in the foothills. While at present there does not appear to be an excessive overdraft on the supply of water from the underground basin, there is a definite need for an over-all determination of supply and demand of the water resources of this area. About 30 new wells have been drilled since 1945 and additional new developments are planned. At a meeting of the Board of Directors of the Tehachapi Soil Conservation District the water and irrigation problems of the valley were discussed.

Consumptive Use - Colorado River Basin - H. F. Blaney, Los Angeles, California.-"Cooperative investigations on consumptive use of water in the Colorado River Basin were continued with the Bureau of Reclamation and Karl Harris of the Soil Conservation Service at Phoenix, Ariz. Results of preliminary studies for comparison of the inflow-outflow method and the Blaney-Criddle method were reviewed. These studies were made in portions of Maricopa and Pinal counties in areas along the Gila River and its tributaries in Arizona. Data on crop acreages, irrigation and stream-flow records are available in the areas. The results obtained by the two methods are within a few percent of each other and the method developed by Soil Conservation Service--Research staff will be extended to the entire lower Colorado River basin in Arizona, California, Nevada, New Mexico, and Utah."

Irrigation Studies - D. W. Bloodgood, Austin, Texas.-"At Fort Stockton, I obtained water measurement and irrigation data from Pecos County Water Control and Improvement District No. 1 for 1939 to 1944. Similar data for 1945 to 1948 were obtained several months ago when the district was visited. These data are to be included in an irrigation report I plan to complete during the present year. When this report is completed, it is planned to enter into an agreement with the district for a consumptive use of water study for crops grown in the area. This can be accomplished with little expense, as most of the equipment necessary for this study has been installed. The district is very cooperative, and good results should be obtained for a future report.

"In the Beaumont area we visited the Texas Agricultural Experiment Substation No. 4, located near China, and consulted with Mr. W. C. Davis, Superintendent, and others regarding cooperative rice irrigation studies during the 1950 season. For this year it was decided to select two fields, 4.5 and 9.3 acres, respectively, for the irrigation studies. The smaller field will be drill planted and the larger one, water planted. The latter field will be irrigated, and soon afterward a tractor with a spike-tooth harrow will be used to mix the water with the soil, making the water very muddy. The rice seed is then dropped by airplane (planted) into the muddy water. Good data should be obtained for the water requirements for rice by using the two different methods of planting. All water will be measured with Parshall flumes equipped with water-stage recorders. One larger size flume will be used for measuring water on the plot and two flumes used for measuring water drained from the field. In the Beaumont Area it is the practice to drain the irrigation water from the field soon after it has been applied. The Board of Water Engineers and Division of Irrigation will furnish three of the Parshall flumes and six of the water-stage recorders, while the Experiment Station will furnish three of the Parshall flumes and operate them during the irrigation season. The irrigation season at the Beaumont station will start during the early part of July, depending on the amount of precipitation."

Lining of Irrigation Canals and Ditches - C. W. Lauritzen, Logan, Utah.-

"The following repairs and improvements were made at the River Laboratory:

1. The drain line was relocated and replaced with larger pipe.
2. The intake pipeline was repaired.
3. A diversion line was installed in conjunction with the installation of calibrating a modified venturi section for measuring irrigation water in open channels.

"Work was begun on the field tests in cooperation with the Wilson Irrigation Company, as mentioned in last month's report. This job is nearing completion. In cooperation with the E. V. Briscoe Company of Kerman, Calif., a Briscoe Ditcher was used for excavating the canal section in which the test sections were to be installed. Considerable difficulty was experienced in removing the loose material to the top of the spoil bank when the ditch became deep and there is no provision for keeping alignment. It is believed that the ditcher has possibilities for excavation as well as cleaning canals and with some refinements, which will be suggested, could do an excellent job of excavation in materials such as were encountered in the Wilson Irrigation Company Canal."

6/6/50

